

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Torch Lake Site, Operable Unit II
Houghton County, Michigan.

STATEMENT OF BASIS

This decision document presents the selected remedial action for the Torch Lake Superfund Site, Operable Unit (OU) II (OU II consists of groundwater, surface water, and sediments associated with the site), in Houghton County, Michigan, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) to the extent practicable. This decision is based upon the contents of the Administrative Record for the site. The attached index identifies the items which comprise the Administrative Record upon which the selection of the remedial action is based.

The State of Michigan concurs with the selected remedy.

DESCRIPTION OF THE SELECTED REMEDY

U.S. EPA has selected a "No Action" remedy for OU II.

The remedy selected for OU II takes into consideration and relies upon:

- The reduction of stampsand loading to surface water bodies expected as a result of the remedial action which will be taken at OUs I & III.
- Ongoing natural sedimentation and detoxification such as that which is occurring in other surface water bodies in the area.
- Institutional programs and practices controlling potential future exposure to site-affected groundwater which are administered at the county and state level.

- The long-term monitoring and the five year review process monitoring requirements of the remedy selected for OUs I & III under a previous Record of Decision for this site.

DECLARATION

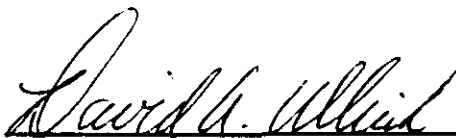
U.S. EPA has determined that the sediment and surface water contamination associated with OU II poses no unacceptable threat to human health. The shallow groundwater associated with OU II which has come into contact with stampsands (waste from copper ore milling) exhibits inorganic contamination which results in unacceptable potential future risks, however these risks are only applicable if, in the future, the stampsands are developed for residential use and drinking water is taken from the shallow groundwater. The practice in the region is to drill drinking water wells into the sandstone aquifer which underlies the stampsands. Since the sandstone aquifer has been found to be unaffected by stampsand contamination, any future risk from contaminated groundwater is unlikely. The Houghton County Health Department and the Michigan Department of Public Health regulate the installation of drinking water wells in the vicinity of the site. These local authorities have been alerted to the potential future threat and currently have permitting programs and development review procedures in place which provide further assurances against future public exposure to stampsand-affected groundwater. Thus, treatment of groundwater to permanently and significantly reduce the toxicity, mobility and volume of contaminants was not found to be necessary to protect human health.

U.S. EPA has determined, however, that contamination associated with Torch Lake sediments currently poses a limited ecological threat. Much of the lake bottom sediment consists of stampsands which were deposited in the lake over many years of active copper ore milling. Levels of contamination (primarily copper) in the stampsand sediments are sufficient to create an inhospitable lake bottom habitat and thus suppress the organisms which are normally expected to inhabit lake sediments. However, given the wide distribution (the lake covers 2,700 acres) and large volumes (approximately 200,000,000 tons) of stampsands deposited in Torch Lake, remediation of the lake bottom is not practical, feasible, nor potentially, in the long run, necessary. Preliminary research information seems to suggest that Torch Lake may be undergoing a recovery in those deeper areas which are not directly subject to the sands eroded from the shoreline. U.S. EPA is hopeful that once the remedy for OUs I & III has been implemented, Torch Lake will cease to be affected by sands eroding from the shore and thus may be able to recover naturally.

Monitoring of the OU II study area will be provided for as an outgrowth of the remedy and the five year review process for OUs I & III. Since the effectiveness of the remedy chosen for OUs I & III will in part be measured by assessing effects on Torch Lake, the monitoring program for OUs I & III will provide sufficient information on the status of the OU II study area. Groundwater, surface water, sediment, and general ecological monitoring, including an evaluation of the rate and effectiveness of organic sediment build-up and the recovery of the

benthic community, will be included as part of the Operation and Maintenance (O&M) plan for OUs I & III. This monitoring will provide information on the effectiveness of the remedy and on the extent of environmental impacts, if any.

Therefore, U.S. EPA has determined that no remedial action is necessary for OU II. As this is a decision for "No Action", the statutory requirements of CERCLA Section 121 for remedial actions are not applicable and no statutory five-year review will be undertaken pursuant to this Record of Decision. However, five year reviews will be conducted for this site pursuant to the Record of Decision for OUs I & III. As mentioned above, the future status of OU II is directly related to the effectiveness of the remedy selected for OUs I & III. Therefore, five year reviews of the remedy for OUs I & III will also assess the OU II study area, and as such will include an evaluation of the status of Torch Lake sediments and ecology, and a reassessment of the necessity for remedial action should the extent of the lake's recovery fall short of expectations.



fr
Valdas V. Adamkus
Regional Administrator
U.S. Environmental Protection Agency

3/31/94
Date

RECORD OF DECISION
DECISION SUMMARY
TORCH LAKE SUPERFUND SITE
OPERABLE UNIT II
HOUGHTON COUNTY, MICHIGAN

Prepared By U.S. EPA

REGION V

MARCH 1993

**RECORD OF DECISION
TORCH LAKE SITE
OPERABLE UNIT II
HOUGHTON COUNTY, MICHIGAN**

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I. SITE NAME, LOCATION, AND DESCRIPTION

The Torch Lake Superfund site (the "Site") is located on the Keweenaw Peninsula in Houghton County, Michigan (See Figure 1). The Site includes Torch Lake, the west shore of Torch Lake, the northern portion of Portage Lake, the Portage Lake Canal, Keweenaw Waterway, the North Entry to Lake Superior, Boston Pond, Calumet Lake, and other areas associated with the Keweenaw Basin. Stampsand piles and slag piles/beach deposited along the western shore of Torch Lake, Northern Portage Lake, Keweenaw Waterway, Lake Superior, Boston Pond, and Calumet Lake are also included as part of the Site. These stampsand piles include stampsands in Lake Linden, Hubbell/Tamarack City, Mason, Calumet Lake, Boston Pond, Michigan Smelter, Isle-Royale, Lake Superior, and Gross Point. The slag piles/beach are located in Quincy Smelter and Hubbell (See Figure 2).

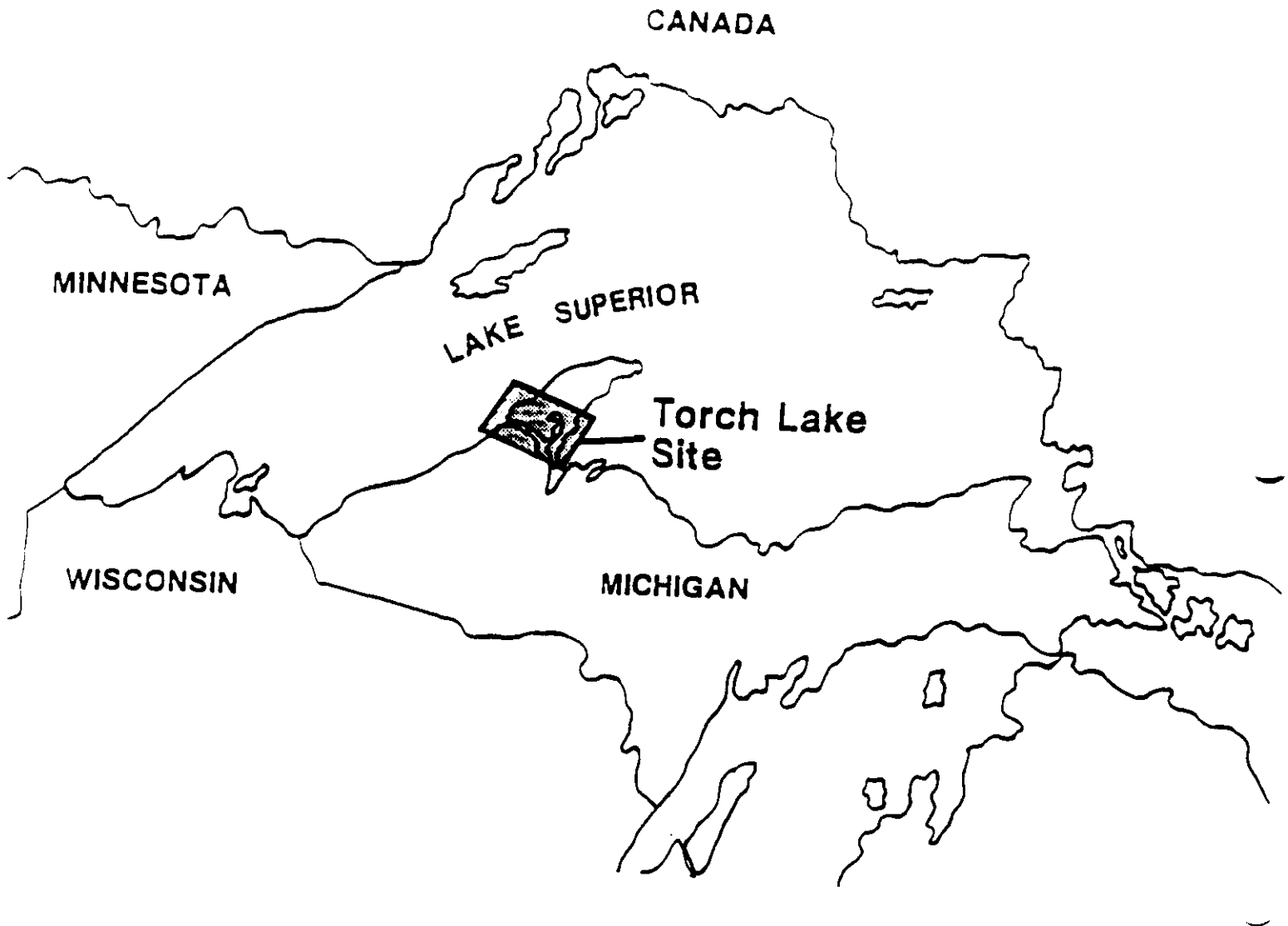
Several small communities are located on the west shore of Torch Lake, the largest of which are Lake Linden, Hubbell/Tamarack City, and Mason. Two large cities, Houghton and Hancock, are located on the south and north side of Keweenaw Waterway. Calumet City is located 5 miles north of Torch Lake (See Figure 2). Torch Lake has a surface area of approximately 2,700 acres, a mean depth of 56 feet, a maximum depth of 115 feet, and a volume of 5.2×10^9 cubic feet. The Trap Rock river and several small creeks discharge into Torch Lake. Torch Lake is used for fishing, boating, limited contact recreation (swimming), non-contact cooling water supply, treated municipal waste assimilation, and wildlife habitat. Wetlands are located on the east portion of the Lake Linden stampsand pile, on the eastern edge of the Hubbell stampsand pile, around Boston Pond, and the eastern shore of Torch Lake. Two nests of bald eagles, which are designated as Endangered Species, are located on the northern side of Portage Lake.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

Torch Lake was the site of copper milling and smelting facilities and operations for over 100 years. The lake was a repository of milling wastes, and served as the waterway for transportation to support the mining industry. The first mill opened on Torch Lake in 1868. At the mills, copper was extracted by crushing or "stamping" the rock into smaller pieces, grinding the pieces, and driving them through successively smaller meshes. The copper and crushed rock were separated by gravimetric sorting in a liquid medium. The copper was sent to a smelter. The crushed rock particles, called "stampsands," were discarded along with mill processing water, typically by pumping into the lakes.

Mining output, milling activity, and stampsand production peaked in the Keweenaw Peninsula in the early 1900s to 1920. All of the mills at Torch Lake were located on the west shore of the lake and many other mining mills and smelters were located throughout the peninsula. In about 1916, advances in technology allowed recovery of copper from stampsands previously deposited in Torch Lake. Dredges were used to collect submerged stampsands, which were then screened, recrushed, and gravity separated. An ammonia

Figure 1



Donohue

MARCH 1989

SITE LOCATION MAP

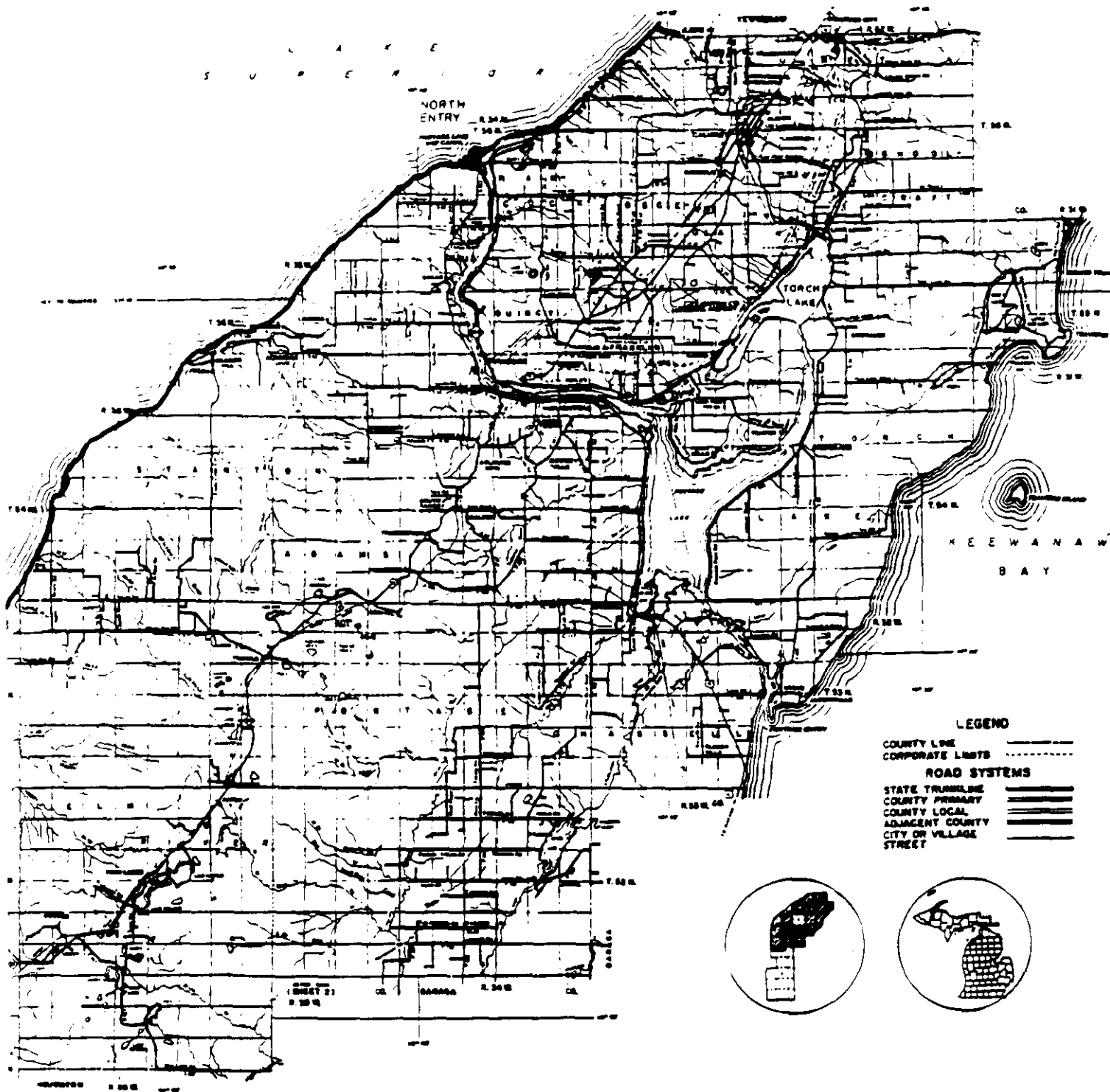
TORCH LAKE

**REMEDIAL INVESTIGATION/FEASIBILITY STUDY
HOUGHTON COUNTY, MICHIGAN**



Engineers • Architects • Scientists

Figure 2



Donohue

JUNE 1989

TORCH LAKE SITE
TORCH LAKE

REMEDIAL INVESTIGATION / FEASIBILITY STUDY
HOUGHTON COUNTY, MICHIGAN



leaching process involving cupric ammonium carbonate was used to recover copper and other metals from conglomerate stampsands. During the 1920s, chemical reagents were used to further increase the efficiency of reclamation. The chemical reagents included lime, pyridine oil, coal tar creosote, wood creosote, pine oil, and xanthates. After reclamation activities were complete, chemically treated stampsands were returned to the lakes. In the 1930s and 1940s, the Torch Lake mills operated mainly to recover stampsands in Torch Lake. In the 1950s, copper mills were still active, but by the late 1960s, copper milling had ceased.

Over 5 million tons of native copper was produced from the Keweenaw Peninsula and more than half of this was processed along the shores of Torch Lake. Between 1868 and 1968, approximately 200 million tons of stampsands were dumped into Torch Lake filling at least 20 percent of the lake's original volume.

In June 1972, a discharge of 27,000 gallons of cupric ammonium carbonate leaching liquor occurred into the north end of Torch Lake from the storage vats at the Lake Linden Leaching Plant. The Michigan Water Resources Commission (MWRC) investigated the spill. The 1973 MWRC report discerned no deleterious effects associated with the spill, but did observe that discoloration of several acres of lake bottom indicated previous discharges.

In the 1970s, environmental concern developed regarding the century-long deposition of stampsands into Torch Lake. High concentrations of copper and other heavy metals in Torch Lake sediments, toxic discharges into the lakes, and fish abnormalities prompted many investigations into long-and short-term impacts attributed to mine waste disposal. The International Joint Commission Water Quality Board designated Torch Lake as a Great Lakes Area of Concern in 1983. Also in 1983, the Michigan Department of Public Health announced an advisory against the consumption of Torch Lake sauger and walleye. The Torch Lake site was proposed for inclusion on the National Priorities List (NPL) in October of 1984. The Site was placed on the NPL in June 1986. The Torch Lake site is also on the Act 307 Michigan Sites of Environmental Contamination Priority List. In Early 1993, the MDPH lifted the fish consumption advisory.

A Draft Remedial Action Plan ("RAP") for Torch Lake was developed by MDNR in October, 1987 to address the contamination problems assumed to be associated with observed fish abnormalities and to recommend remedial action for Torch Lake. Although studies showed no cause and effect relationship between the contaminants of the stampsands and the fish tumors, revegetation of lakeshore stampsands to minimize air-borne particulate matter was one of the recommended remedial actions in the RAP. The RAP recommended natural sedimentation as the only feasible approach to remediating the lake bottom.

In May and June 1988, Remedial Investigation/Feasibility Study (RI/FS) Special Notice Letters were issued to Potentially Responsible Parties (PRPs). Negotiations for a RI/FS Consent Order with the PRPs were not successful. Subsequently, U.S. EPA contracted with Donohue & Associates in November 1988 to perform the RI/FS at the Site.

Due to the size and complex nature of the Site, three Operable Units (OUs) have been defined for the Site (see Figure 3). The western shoreline of Torch Lake constitutes OU I. Torch Lake itself, and other water bodies comprise OU II. OU III consists of locations outside this area. This ROD is being developed for OU II.

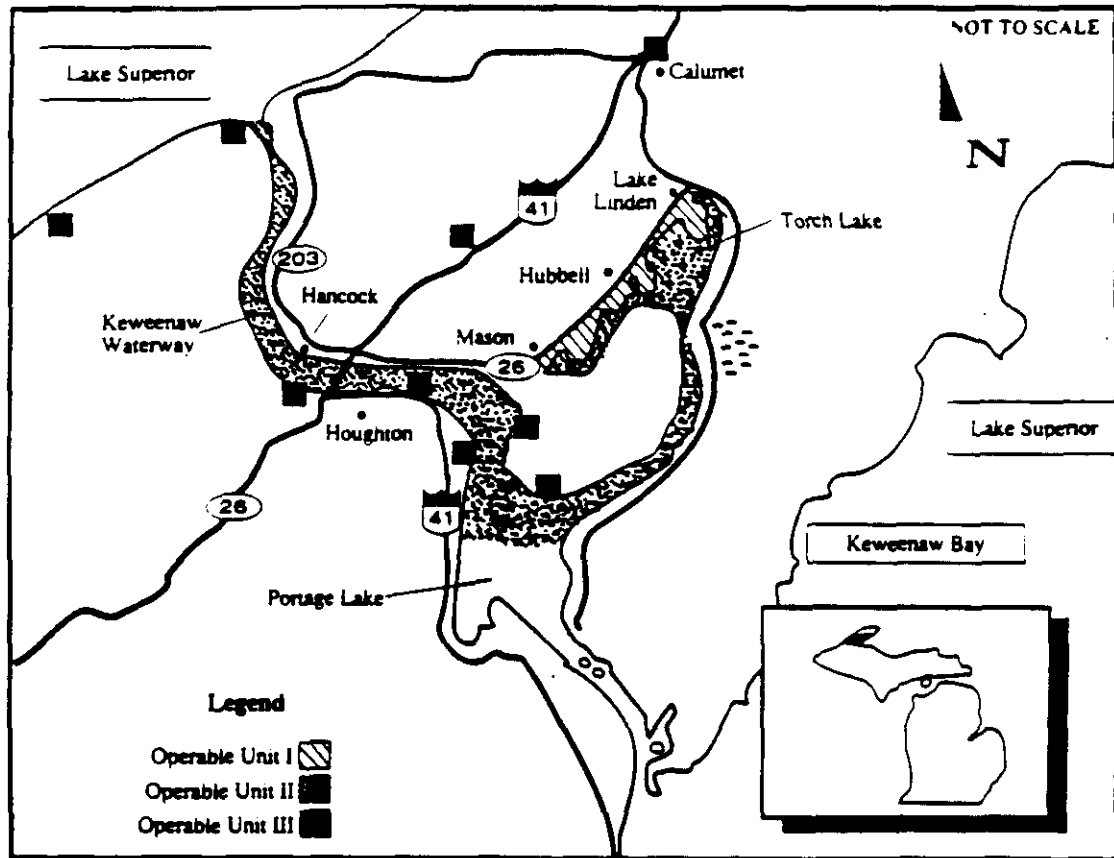


Figure 3

OU I includes surface stampsands, drums, and slag pile/beach on the western shore of Torch Lake. An estimated 440 acres of stampsands are exposed surficially in OU I. A smaller deposit of smelter slag pile/beach, encompassing approximately 9 acres, is located near Hubbell, south of the Peninsula Reclamation Plant.

OU II includes groundwater, surface water, submerged stampsands and sediments in Torch Lake, Portage Lake, the Portage Channel, Keweenaw Waterway, Lake Superior, Boston Pond, and Calumet Lake.

OU III includes stampsands and slag deposits located in the north entry of Lake Superior, Michigan Smelter, Quincy Smelter, Calumet Lake, Isle-Royale, Boston Pond, and Grosse-Point.

The Remedial Investigations (RI) have been completed for all three OUs. The RI and Baseline Risk Assessment (BRA) reports for OU I were finalized in July 1991. The RI and BRA reports for OU III were finalized on February 7, 1992. The RI and BRA reports for OU II were finalized in April 1992. The OU II RI addendum no. 1 (Additional bodies of water) was completed in March, 1992, and another addendum addressing the "hot spot" was completed in July 1992. The Ecological Assessment for the Site was finalized in May 1992. The Feasibility Study (FS) and Proposed Plan which contains the U.S. EPA's recommended remedy for OU I and III were issued to the public on May 1, 1992, and a ROD for OUs I & III was signed on September 30, 1992.

In response to reports that drums may have been dumped into the lake, the U.S. EPA conducted a subbottom profile (seismic) survey of the lake bottom in May 1989. The area in which this survey was conducted is immediately off-shore from the old Calumet and Hecla smelting mill site. The survey located several point targets (possibly drums) on the bottom of Torch Lake. Based on the seismic survey and the discovery of drums at various points along the western shore of Torch Lake, U.S. EPA and six companies and individuals entered into an Administrative Order on Consent, dated July 30, 1991, whereby the companies and individuals agreed to sample and remove drums located on the shore and lake bottom. Pursuant to the Administrative Order, these entities removed 20 drums with unknown contents from off-shore of Peninsula Copper Inc., and the old Calumet and Hecla smelting mill site in September 1991. 808 empty drums were found in the lake bottom. These empty drums were not removed from the lake bottom.

U.S. EPA determined that a full-blown FS was not necessary for OU II. Instead, U.S. EPA produced a Remedy Position Paper which presents the results of the efforts undertaken by U.S. EPA to evaluate the remedial options for OU II (the Remedy Position Paper may be found in the Administrative Record). This approach to remedy evaluation was predicated upon a recognition of the unique nature of the Torch Lake site and was intended to take advantage of an opportunity to streamline the deliberative process. The Remedy Position Paper, which will serve as the Focused Feasibility Study for OU II, summarizes U.S. EPA's view of the scope and complexity of OU II, describes the operative site conditions and various potential remedial measures, assesses the feasibility considering the conditions, documents U.S. EPA's position regarding the measures which have been considered, and describes the Proposed Plan for OU II. The various discussions embodied within the position paper are presented in a qualitative fashion. The preamble to the NCP (53 FR 51423) provides for "tailoring selection and documentation of the remedy based on the limited scope or complexity of the site problem and remedy". U.S. EPA believes that this language anticipates and encourages the sort of streamlined approach to remedy deliberation and documentation employed by the position paper.

III. COMMUNITY RELATIONS ACTIVITIES

A Community Relations Plan for the Site was finalized in July 1988. This document lists contacts and interested parties throughout the local government and community. It also

establishes communication pathways to ensure timely dissemination of pertinent information. An RI "Kickoff" meeting was held on August 8, 1989 to explain the RI process for the Site. A fact sheet was developed in conjunction with this meeting. Advertisements were placed in the Daily Mining Gazette and a press release was sent to all local media.

A public meeting was held on August 27, 1990 to explain the results of the OU I investigation and the scope of work for the OU II and III investigations. A fact sheet was developed in conjunction with this meeting. Advertisements were placed to announce the meeting and a press release was sent to all local media.

A public meeting was held on October 17, 1991 to update the investigation results for OUs II and III, and the drum removal activity. A fact sheet was developed in conjunction with this meeting. Advertisements were placed to announce the meeting and a press release was sent to all local media.

The RI/FS and the Proposed Plan for OUs I and III were released to the public in May 1992.

A public meeting was held on May 12, 1992 to present the results of the RI/FS and the recommended alternatives as presented in the Proposed Plan. Pertinent site related documents were made available in the information repositories maintained at the Lake Linden-Hubbell Public Library and Portage Lake District Library. The administrative record for the site was placed at the Portage Lake District Library. A notice of the availability of these documents was published in the Daily Mining Gazette on April 29, 1992 in conjunction with the release of the Proposed Plan for OUs I & III. Press releases were also sent to all local media. A public comment period for the OUs I & III ROD was held from May 1, 1992 to June 1, 1992. Requests for an extension of that comment period were made and the public comment period was extended until July 13, 1992. All comments which were received by U.S. EPA during the public comment period, including those expressed verbally at the May 12 public meeting, were addressed in the Responsiveness Summary which is the third section of the ROD for OUs I & III. The ROD for OUs I & III was signed on September 30, 1992. A public meeting was held on October 8, 1992 to explain the final ROD for OUs I & III.

On December 12, 1992 a public meeting was held to explain the results of the OU II investigation. The Proposed Plan for OU II was released to the public in February 1994. A notice and press release were sent out in conjunction with the OU II Proposed Plan. A public meeting was held to explain the Proposed Plan for OU II on March 3, 1994. The comment period for OU II extended from February 17 to March 18, 1994. All comments which were received by U.S. EPA during the public comment period, including those expressed verbally at the March 3 public meeting, were addressed in the Responsiveness Summary which is the third section of the ROD for OU II.

IV. SCOPE & ROLE OF OPERABLE UNIT

As discussed in Section II, U.S. EPA has divided the Site into three operable units. OUs I & III are being addressed by a ROD signed in September 1992. OU II includes areas of potential contamination in and around Torch Lake, including groundwater, submerged stamp sands at the bottom of the lake (i.e. sediment), and surface water. OU II is related to OUs I & III primarily in that wind-blown and eroded stamp sands from the latter end up in the former. These conditions serve as a continuing source of environmentally harmful contamination to the lake and diminish the effectiveness of the lake's natural sedimentation process. The remedy chosen for OUs I & III, stabilization and revegetation of the stamp sand piles near the lake, was in part selected because it will address the erosion problem. Furthermore, Torch Lake may already be undergoing a recovery in those portions which are not subject to the sands eroded from the shoreline. Once the remedy for OUs I & III has been implemented, near shore areas may also recover.

Future monitoring of the status and progress of the OU II study area will be provided for as a component of the monitoring program for the remedy for OUs I & III and the five year review process associated with OUs I & III. Groundwater, surface water, sediment, and general ecological monitoring including an evaluation of the rate and effectiveness of organic sediment build-up and the recovery of the benthic community will be included as part of the O&M plan for OUs I & III. This monitoring will provide information on the effectiveness of the remedy and on the extent of environmental impacts, if any. Since the effectiveness of the remedy chosen for OUs I & III will in part be measured by assessing effects on Torch Lake, the monitoring program for OUs I & III would be incomplete if it did not encompass the OU II study area. In addition, the five year review process will include an evaluation of the status of Torch Lake sediments and ecology, and will reassess the necessity for remedial action should the extent of the lake's recovery fall short of expectations.

V. SITE CHARACTERISTICS AND RISK SUMMARY

Pursuant to the authorities under CERCLA, as amended by SARA, and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), an RI was conducted at the site. The RI was conducted by U.S. EPA between 1989 and 1992. A Baseline Risk Assessment and an Ecological Risk Assessment were prepared by the U.S. EPA to evaluate the level of risk to human health and the environment. This section summarizes the analysis presented in the RI Report and addenda and the Baseline Risk Assessment (finalized April 1992) and the Ecological Assessment (finalized April 1992).

The remedial investigation of OU II was conducted to determine the nature and extent of contamination in groundwater, lake bottom sediments, and lake surface waters to assess the potential adverse health and environmental effects resulting from releases of hazardous substances from the stamp sands deposited into the lake from copper mining and processing operations.

The OU II RI report documents activities performed to characterize the physical and chemical environment of OU II including characterization of the physical extent of the stampsand deposits in the lake, characterization of groundwater flow, chemical characterization of groundwater, sediments, and surface water and assessment of human health and environmental impacts.

INVESTIGATION RESULTS

A bathymetric survey of the lake was conducted and the findings were compared to an 1864 bathymetric survey of Torch Lake. In 1990, it was determined that the shoreline measures 20.3 miles, the lake surface is approximately 2,700 acres, and the lake contains 103,000 acre feet of water. This is a net gain of nearly 5 miles of shoreline, but a net loss of approximately 600 acres of surface water area, and nearly 111,000 acre feet of water volume from the 1864 lake configuration. A total of approximately 179 million cubic yards of stampsands were deposited below the water level of Torch Lake. Submerged stampsands deposited in Torch Lake range in thickness from 25 feet (at the bottom) to more than 130 feet thick.

Sediment samples were collected at 25 locations along the lake bottom to characterize their physical structure and to assess potential contaminant presence in the sediments. Lake bottom sediments were found to be comprised of an organic layer overlaying conglomeritic or amygdaloidal stampsands/sediment at all locations. The organic layer typically included two distinct layers: An upper, thin layer comprised primarily of soft organic materials such as leaves and plant fibers; and a thicker, lower layer of more homogeneous decomposed plant matter mixed with very fine grained stampsands. The thickness of the organic layer tended to vary across the lake. Silt and clay size stampsands were encountered in deeper water, while fine to medium sand size stampsands were prevalent in shallower water.

An apparent "hot spot" in the sediment was measured at sampling location SDO9, offshore of the former Calumet and Hecla Smelter at Hubbell. Sampling location SDO9 measured significantly high for several inorganic and organic compounds in relation to both background and other study area samples. Sediment samples from the area offshore from Hubbell had high concentrations of arsenic, chromium, copper, lead, nickel, and silver; and high concentrations of polyaromatic hydrocarbons and one congener of PCB, Arachlor 1254. Concentrations were highest within the thin organic layer, representative of the most recent sediment deposition in this area. It is not clear if the metal contaminants derived from the stampsands. With the exception of arsenic, chromium, and lead most metals detected in the sediment samples have concentrations similar to stampsands concentrations detected during the OU I remedial investigation.

Surface water samples were collected concurrently with sediment samples. Surface water samples were taken (two at each location) based on measurement and determination of the warmer epilimnion and colder hypolimnion. Several chemicals detected in the water column exceed the State of Michigan's Rule 57(2) of Act 245. Chemical characterization of the

surface water for contaminants of potential concern indicated a relatively uniform distribution of inorganic compounds at low levels. Only two organic compounds were detected, each at one location and at low concentrations.

A total of 18 groundwater monitoring, irrigation, and residential wells were measured to evaluate groundwater conditions, and sampled to assess contaminant levels. The highest levels of aluminum, chromium, cobalt, copper, iron, magnesium, nickel, and vanadium were detected at a Portage Lake Water Sewage Authority monitoring well - PLWSA No. 1. Arsenic, barium, and manganese were detected in their highest levels in well nests constructed as part of the RI at the north end of the lake. A distinct contaminant plume or indication of contaminant migration has not been determined in the media sampled at Torch Lake.

Groundwater occurs between 7 and 23 feet below ground surface within the stampsands. Groundwater flow within the Jacobsville Sandstone and the stampsands is to the south-southeast with groundwater discharge to Torch Lake. Horizontal and vertical gradients within the stampsands are high enough to move groundwater relatively quickly through the stampsands with discharge to Torch Lake and natural lake bottom sediments.

The fate and transport of inorganic and organic contaminants of potential concern are determined largely by sorption and complexation processes as well as processes of oxidation, precipitation, and ion exchange for inorganic compounds. The complex interaction of these processes tends to limit the mobility of the organic and inorganic compounds of concern. Moreover, supplementary studies by the U.S. Bureau of Mines found that the sands release very little metal. Potential contaminant movement to Torch Lake is primarily due to erosion and infiltration of precipitation through stampsands, throughflow, and subsequent discharge to the lake.

BASELINE RISK ASSESSMENT

The baseline risk assessment for OU II was performed to evaluate the potential adverse health effects for both current and future residents at Torch Lake resulting from exposures to hazardous substances determined to be in the groundwater, lake sediments, and lake surface waters. Since the hot spot is located offshore in approximately 30 to 75 feet of water, human contact was not deemed realistic, so the hot spot was not evaluated for human health risk. The carcinogenic risk for OU II is dominated by exposure to groundwater for hypothetical future adult and child residents living atop the stampsands at Torch Lake. Chemicals contributing to these risks are mainly arsenic and beryllium. For noncarcinogenic risks, ingestion of groundwater by hypothetical future residents also dominates the risk assessment.

The risk assessment compared the potential excess lifetime cancer risks calculated for various OU II study area scenarios to U.S. EPA's acceptable risk range (1×10^{-6} to 1×10^{-4}). This exercise provides estimated upper limits of additional cancer cases that could occur as a

result of repeated exposures in the future to site related contaminants (these risks were estimated by assuming a person would be exposed to the contaminants of concern every day over a period of a lifetime). The excess lifetime cancer risks should be regarded as conservative estimates of the potential cancer risk rather than the actual representations of true cancer risks.

Exposure risks from carcinogenic health hazards (based on one-in-one million criteria) was calculated to be 1 additional case per 1,000 people exposed (1×10^{-3}) for hypothetical future child and adult residents of Torch Lake stampsands for the ingestion of groundwater. The future risk scenario is defined by the possibility that, in the future, people could build homes on these sands, construct wells which would draw groundwater from the water table aquifer which would exhibit levels of contamination identical to the most contaminated wells sampled during the investigation, and use these wells as a drinking water supply continuously throughout a 70 year lifetime. This risk, in addition to being solely attributable to the potential future convergence of unlikely circumstances, is further mitigated by actual practices in the region. No one in the study area is currently drinking groundwater taken from stampsand zones. Locally, drinking water supply wells are installed in the sandstone aquifer which underlies the stampsands, and there is no evidence that the sandstone aquifer is affected by contamination from stampsands. Residential wells which were sampled during the RI are located upgradient of the Torch Lake sands and are considered to be reflective of background conditions. The results of RI analysis of samples taken from two deep irrigation wells installed beneath the stampsands near Lake Linden and near Hubbell/Tamarack City show that groundwater below the stampsands is not impacted. Also, the City of Houghton water supply wells are set beneath the Isle Royale stampsands and are not affected.

Furthermore, the Houghton County Health Department has institutionalized local practices with respect to groundwater use by employing increased scrutiny to any building or development involving property which contains stampsands. The County Health Department will ensure that the existing county well permitting program and the building permit program will serve as locally imposed Institutional Controls to prevent the public from installing drinking water wells which would be screened so as to draw from groundwater which has come into contact with stampsands. In addition, the Michigan Department of Public Health (MDPH) has informed U.S. EPA that existing permitting and review controls at the state level would provide further assurances that stampsand-affected groundwater would not be permitted as drinking water. U.S. EPA is satisfied that these measures, which are administered at the local and state levels through the Houghton County Health Department and the MDPH, will provide sufficient impediment to the public use of stampsand-affected groundwater.

Carcinogenic health hazards for current residents range from 6 additional cases per 100,000 people exposed (6×10^{-5}) to 3 additional cases per 10,000 people exposed (3×10^{-4}) based on ingestion of surface waters, sediments, fish from Torch Lake, and from dermal contact (swimming) in the lake. Approximately two-thirds of the estimated cancer risk from lake media is attributable to the fish ingestion pathway. The major portion of the risk from fish

ingestion is contributed by PCBs (Aroclor 1254). It must be noted that Aroclor 1254 was not detected in any surface water sample at Torch Lake and it is unlikely that benthic food-chain organisms are present in the vicinity of elevated PCB sediment concentrations, due to copper toxicity. There presently is no clear link between OU II contamination and the contamination detected in Torch Lake fish. In addition, the PCB concentration in Torch Lake fish tissue (0.025 to 0.151 mg/kg) is at the low end of the average PCB levels found in Great Lakes and inland Michigan lakes fish and is considerably below the FDA advisory level for PCBs in fish of 2 mg/kg.

The measure of noncarcinogenic health risk is termed a hazard index (HI). When the HI exceeds 1.0, there is a potential for adverse health effects. Subchronic and chronic, noncarcinogenic health hazard indices greater than 1.0 have been calculated for future residents at Torch Lake from ingestion of groundwater. However, no noncarcinogenic health hazard indices greater than 1.0 have been calculated for current or future residents at Torch Lake from ingestion of surface water, sediments, or fish, once toxicity endpoints (that is, the part of the body that the individual chemicals have been found to affect) have been taken into consideration.

ECOLOGICAL RISK ASSESSMENT

The ecological risk assessment found that levels of copper and other metals in the stampsand sediments are sufficiently high to pose significant risk to those organisms which would normally reside in the lake bottom sediments (benthic organisms). In fact, for much of Torch Lake, copper levels in the stampsand sediments are high enough to be toxic to native benthic organisms and thus completely suppress benthic communities. The hot spot, due to contaminant levels elevated above those of the rest of the lake, was found to pose the greatest incremental risk to exposed populations. However, the actual potential for exposure to hot spot contaminants strongly mitigates this statement of incremental ecological risk, since sediment toxicity is already high enough to suppress benthic organisms. Absent this link in the food chain, the normal transfer mechanism from sediment to higher order organisms is basically inoperative. Although the sediment effect constitutes a bona fide degradation of the Torch Lake ecology, this appears to be the sole demonstrable ecological risk-related impact, perhaps in part due to the lack of a food chain connector. Torch Lake continues to support a healthy fishery, and no impacts to eagles or gulls could be ascertained. Furthermore, supplemental to the ecological risk assessment, further study conducted by the MDNR could discern no conclusive cause for the fish tumors found in earlier studies.

SUMMARY

In summary, the risk assessment shows there is no unacceptable current or future health risk from exposure to site surface water or sediment. Groundwater, however, based on several samples taken from wells installed in the stampsands, was found to pose an unacceptable risk to anyone who may, in the future, build a home on the stampsands and take drinking water from the water table aquifer which flows through the sands. However, as discussed above,

U.S. EPA is satisfied that permitting and development review procedures which are administered at the local and state levels through the Houghton County Health Department and the MDPH, will provide sufficient impediment to the public use of stampsand-affected groundwater.

Ecological affects are currently severe. Levels of contamination (primarily copper) in the stampsand sediments are sufficient to create an inhospitable lake bottom habitat and thus suppress the organisms which are normally expected to inhabit lake sediments. However, given the wide distribution (the lake covers 2,700 acres) and large volumes (approximately 200,000,000 tons) of stampsans deposited in Torch Lake, remediation of the lake bottom is not practical, feasible, nor potentially, in the long run, necessary. Preliminary research information seems to suggest that Torch Lake may be undergoing a recovery in those deeper areas which are not directly subject to the sands eroded from the shoreline. U.S. EPA is hopeful that once the remedy for OUs I & III has been implemented, Torch Lake will cease to be affected by sands eroding from the shore and thus may be able to recover naturally. U.S. EPA has detailed the reasons for this position in the Torch Lake OU II Remedy Position Paper which serves as a Focused Feasibility Study for OU II (the Remedy Position Paper may be found in the Administrative Record).

VI. EXPLANATION OF SIGNIFICANT CHANGES

There are no significant changes from the recommended alternative described in the Proposed Plan.

APPENDIX I

RESPONSIVENESS SUMMARY

**TORCH LAKE SUPERFUND SITE
OPERABLE UNIT II
HOUGHTON COUNTY, MICHIGAN**

March 1994

RESPONSIVENESS SUMMARY
TORCH LAKE SUPERFUND SITE
OPERABLE UNIT II
HOUGHTON COUNTY, MICHIGAN

1.0 OVERVIEW

At the start of the public comment period for the Torch Lake Superfund site, the U.S. Environmental Protection Agency (U.S. EPA) and the Michigan Department of Natural Resources (MDNR) proposed the No Action alternative for addressing the groundwater, surface water, submerged sands and sediments in Torch Lake, Portage Lake, the Portage Channel, Keweenaw Waterway, Lake Superior, Boston Pond, and Calumet Lake (OU II). After careful review of the comments received from the public during the public comment period and public meeting, U.S. EPA has decided to move ahead with the No Action alternative.

Comments received at a March 3, 1994, public meeting in Houghton, Michigan, and written comments received through the mail predominantly reflected community support for the alternative proposed by the U.S. EPA.

This Responsiveness Summary responds to the comments and concerns expressed by the public and the potentially responsible parties (PRPs) in written and oral comments received by U.S. EPA during the public comment period, which ran from February 17 to March 18, 1994. A court reporter recorded spoken comments at a public meeting that was held on March 3, 1994.

Two sections follow:

- * Background on community involvement and history of community relations activities at the Site
- * Summary of comments received during the public comment period, including U.S. EPA responses

**2.0 BACKGROUND ON COMMUNITY INVOLVEMENT/HISTORY OF
COMMUNITY RELATIONS ACTIVITIES**

See Section III of the ROD.

3.0 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

The public comment period designated for the Torch Lake Superfund site (Operable Unit II) was held from February 17 to March 18, 1994, and included a public meeting on March 3, 1994. Comments on the Proposed Plan received during the public comment period are listed below. Some of the comments have been paraphrased so they could be summarized effectively in this document. For original comments in their entirety, the reader is referred to the public meeting transcript and written comments which are available for review at public information repositories at Lake Linden-Hubbell Public Library in Lake Linden, at Portage Lake District Library in Houghton, and at U.S. EPA offices in Chicago, Illinois. The locations of these repositories are listed in Appendix II.

A U.S. EPA response follows each comment. Comments and responses have been divided into four sections. The four sections are:

- 3.1 Summary of comments from the local community
- 3.2 Summary of comments from elected government officials
- 3.3 Summary of comments from Michigan Technological University
- 3.4 Summary of comments from Universal Oil Products, Inc.

3.1 Comments from Residents of the Local Community

3.1.(a)

COMMENT: Two residents submitted comments expressing concern about the "hot spot" in Torch Lake. A third resident submitted: "...I share a concern for this hot spot, not knowing what it is...". The commenters are concerned specifically that future recolonization of the hot spot area by bottom-dwelling organisms could mobilize hot spot contamination. One commenter is concerned that the contamination in the hot spot is derived from large amounts of solid waste materials dumped from the Calumet & Hecla smelter area prior to 1968 and is not an artifact of more recent lakeside activities. The other commenter is concerned that the deposition of the contaminated material may be ongoing. Both suggest that the hot spot merits action due to the distinct nature and concentration of the contamination found there. One of the commenters proposes (and the other urges consideration of the proposal) that U.S. EPA evaluate the placement of a PVC cap over the hot spot area to serve as a barrier to further contaminant migration and as a barrier to contaminated sediment disturbance by future bottom-dwelling organisms. Such a cap, suggests the commenter, would then require boat anchoring restrictions or other restrictions so as to prevent damage to the cap. In addition, one of the commenters stresses the importance of ongoing monitoring, and requests that additional study of the Lake Superior

shoreline be conducted.

U.S. EPA RESPONSE: U.S. EPA also shares the commenters' concerns regarding the hot spot. The hot spot contamination is of significantly greater magnitude than and is clearly distinct from the contamination associated with the stampsands or the stampsand reprocessing activities which have had an effect on Torch Lake. As a result, the hot spot was deemed to deserve and subsequently received special consideration in the Operable Unit II Final Remedy Position Paper. The Position Paper acknowledges the hot spot as presenting the greatest potential environmental risk to exposed biota. However, the Position Paper then goes on to say that this risk is mitigated by the essentially lifeless condition of this area of the Torch Lake bottom. In other words, since nothing lives in the sediment, there is no real mechanism for transfer of contaminants from the sediment. Also, conditions in the lake seem to indicate that the contamination in the sediment is rather stable and is not spreading to the water column. U.S. EPA agrees with the commenters that a lifeless lake bottom is not something to celebrate. However, Torch Lake is not lifeless. Further, the extent of contamination is a fact, and so must be noted and factored into our assessment of the necessity or advisability of remedial action targeted at the hot spot.

The Position Paper dwells on the impracticability of taking action at the hot spot because the sediment is light and easily disturbed. One of the commenters has proposed the use of a thin, light PVC cover as a solution to this problem. The cover, the commenter submits, could be placed in such a way as to minimize the disturbance of the hot spot sediments. The commenter then goes on to highlight the reasonably low cost (roughly \$6,000 to \$23,000 per acre) of this cap material, according to the vendor. U.S. EPA acknowledges the initial attractiveness of this proposal at this unit cost and concedes that this technology was not adequately explored prior to the release of the Position Paper. However, since then, U.S. EPA experience with a PVC cap over PCB contaminated sediment in the Manistique harbor area has been researched and evaluated. That application involved 1/2 acre of contaminated material along a river shore line in a maximum of 12 feet of water. The Manistique cap, once fabrication, mobilization, installation, anchoring, and diver support was accounted for, resulted in a final cost of roughly \$250,000.

At Torch Lake, the hot spot would require a cap 6 to 20 times larger than the Manistique cap, installed in much deeper water. The scale and depth at Torch Lake would result in substantially higher final installation cost than the Manistique cap. Obviously, such a final cost bears very little resemblance to the per acre price quoted by the vendor contacted by the commenter and therefore significantly alters the cost effectiveness of the proposal. As a result, U.S. EPA can not support a PVC cap. Without a cap, anchoring restrictions are not thought to be necessary.

Furthermore, in addition to technical feasibility, the Position Paper also examined the necessity of taking action at this time. This particular discussion hinges on three conditions: the apparent stability of the hot spot sediment, the apparently limited effects of the hot spot on the ecosystem of the lake, and the impact of natural sedimentation.

The contaminants in the hot spot appear to be tightly bound to a thin layer of organic sediment. This is a result of organic chemical complexation, in the case of the inorganic contaminants (copper, lead, arsenic, chromium, etc.). With complexation, large organic molecules grab and hold tightly onto the inorganic contaminants. Absent a mechanism which alters the physical or chemical conditions, such as a significant pH change, direct sunlight, high temperature, etc., the inorganic contaminants can be expected to stay attached to the organic sediment.

As mentioned above, the contaminants in the hot spot are not currently posing an ecological risk because nothing lives in the sediments. This will continue to be the case until the natural sedimentation process at work in the lake buries this area with new clean sediments over several years. The sedimentation process is currently impaired due to the erosion of stampsands from the western shore of Torch Lake. Once the sands are covered and vegetated, the natural sedimentation process can proceed to cover the lake bottom with new clean sediments. Once a layer of cleaner sediments is in place, bottom-dwelling organisms should become reestablished. It is this scenario, together with the above-mentioned stability of the hot spot sediments, which has led U.S. EPA to conclude that No Action for OU II combined with the monitoring components of the OU I & II remedy is the best course of action at this time. We will have monitoring data which will allow U.S. EPA to evaluate the progress of the recovery of this portion of the lake, and if not, to determine if other action is necessary to address the hot spot.

The commenters' concern relative to future contaminant release as a result of recolonization of the lake bottom is acknowledged as a possibility and will figure into the monitoring scheme for the lake. However, in response, U.S. EPA believes that the lake has a tremendous natural capacity for dealing with inorganic contamination via the organic chemical complexation process described above. The fact that the sands are loaded with copper, yet the water column concentration of copper has remained stable for the last 20 years, speaks to the effectiveness of the lake's natural processes. U.S. EPA is satisfied that the potential of this natural process is further justification for the No Action Alternative.

Lastly, in response to the commenter's request for further study of the effect of stampsand deposits on the Lake Superior shoreline, in connection with the Record of Decision for OUs I & III, the Freda, Redridge, and North Entry stampsands along the Lake Superior shoreline will be evaluated, for potential stabilization.

3.1.(b)

COMMENT: "I would like to call for common sense and some data-based scientific reasoning in the decision-making of EPA and Michigan DNR".

RESPONSE: U.S. EPA acknowledges this comment and can only strive to adhere to the fundamental wisdom represented thereby.

3.1.(c)

COMMENT: Other commenters, including one commenter who claims to represent 3500 Keweenaw area residents, expressed support for the proposed No Action alternative.

RESPONSE: U.S. EPA acknowledges these comments.

3.1.(d)

COMMENT: Two residents presented conclusions based on 6 years of independent research of the Torch Lake area. In their comments they suggest a comprehensive solution to remediating the copper mining wastes throughout the Keweenaw Peninsula. This solution involves construction of a power plant, processing stations, and a repository site for reclaimed mining wastes. The process envisioned involves removal of mining wastes, separation of toxins, and containment of the residual material in the repository site.

RESPONSE: U.S. EPA has determined that the scale, environmental repercussions, and extremely high cost of such a comprehensive solution render this approach impracticable and insupportable. This conclusion is reflected in the Feasibility Study for OUs I & III which found that the reclamation of the OU I & III sands alone, to say nothing of the sands in Torch Lake, Portage lake, and throughout the Keweenaw Peninsula, could not possibly be justified by the limited risks to human health and the environment posed by the sands. U.S. EPA did find sufficient justification for the relatively limited action, covering and vegetating the OU I & OU III sands, contained in the Record of Decision for OUs I & III.

3.2 Comments from Government Officials and Other Local Officials

COMMENT: Several local officials collectively submitted general comments in support of the proposed No Action Alternative. The following are excerpts:

"Allowing the stamp sands to remain in the lake under a "no action" alternative combined with periodic monitoring will adequately protect the local population and the environment with only a limited outlay of funds for sampling and analysis. Furthermore, this approach does not in any way prevent a future review of the "no action" alternative and substitution of a more aggressive approach if monitoring data clearly indicate that more action is warranted. The intrusive remediation of stamp sand deposits in the lake system will involve removal and management of hundreds of thousands of cubic yards of stamp sands at a cost level and time commitment which are not at all commensurate with the benefit, if indeed there is any, to be gained. Technologies that are available for this remediation option are experimental, disruptive, extremely costly, and are likely to result in more harm than good."

"The US EPA has spent some \$3.5 million to study this site. seeking and receiving input from the surrounding community and MDNR. They have demonstrated a deep concern for the health and safety of the public and the environment, and have conservatively approached issues of risk as seen in US EPA's recommended remedies for Operable Unit Number I and Operable Unit Number III. Given this approach, US EPA's recommendation for Operable

Unit Number II should be entitled to great deference, and should be supported by all concerned parties and agencies, unless there is some new and compelling information which US EPA has overlooked. EPA's well-considered approach to Operable Unit II is both protective of human health and the environment, and reflective of our understanding of what is clearly an extremely unbalanced cost/benefit ratio."

RESPONSE: U.S. EPA acknowledges these comments.

3.3 Summary of Comments from Michigan Technological University

COMMENT: Michigan Technological University submitted a volume of comments and supporting documentation. The comments express support for the No Action alternative.

RESPONSE: U.S. EPA acknowledges these comments.

3.4 Summary of Comments from Universal Oil Products Inc.

COMMENT: Universal Oil Products Inc. (UOP) submitted a volume of comments and supporting documentation. The comments express support for the No Action alternative.

RESPONSE: U.S. EPA acknowledges these comments.

APPENDIX III

ADMINISTRATIVE RECORD INDEX

APPENDIX II
**LOCATION OF
INFORMATION REPOSITORIES**

An information repository contains laws, work plans, community relations plans, technical reports, and other documents relevant to the investigation and cleanup of Superfund sites. The information repositories for the Torch Lake Superfund site have been set up at the following locations:

Lake Linden-Hubbell Public Library
610 Calumet
Lake Linden, Michigan 49945
(906) 296-0698

Portage Lake District Library
105 Huron
Houghton, Michigan 49931
(906) 482-4570

Administrative record repositories have been established at Portage Lake District Library in Houghton and at U.S. EPA's Region 5 office in Chicago. The administrative record contains all of the documents, reports, laboratory data, and other material U.S. EPA relied upon in reaching a decision on the selection of the proposed plan.

ADMINISTRATIVE RECORD INDEX

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ORIGINAL

TORCH LAKE SITE, OPERABLE UNITS I AND III

TORCH LAKE, MICHIGAN

04/29/92

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1	00/00/00			Calumet and Hecla Mining Company Annual Reports: 1907, 1917, 1927, 1937, 1947, 1957, 1967	14e
2	00/00/00	Toddart, A., Professor		Excerpt from Book Entitled: Handbook of Mineral Dressing	12
3	00/00/00	Weston	USEPA	Incomplete Project Plan for Characterization of Bank Anomalies (no cover page)	14
4	00/00/00			Map of Lake Superior District	+
5	00/00/00			Map: Laurium Quadrangle	1
6	00/00/00			Maps--Roads, Wetlands, Soil	7 10
7	00/00/00			Moody's Industrial Manual Pages on Universal Oil Products for years 1969, 1984	5
8	00/00/00			NPL Candidate: Narrative Summary	1
9	00/00/00	USEPA		National Priorities List Site: Torch Lake	1
10	00/00/00	US Geological Survey		Pages From Mineral Resources of the United States for Years 1910, 1920, 1930, 1940	34
11	00/00/00	Bureau of Mines		Pages From Vol. 3 of Minerals Yearbook for years 1955, 1960, 1960, 1975	21
12	00/00/00			Population of Places--Michigan	1
13	00/00/00	Black, J., Evans, E., et.al.		Revised Manuscript: Epizootic Neoplasms in Fish From a Lake Polluted by Copper Mining Wastes	28
14	00/00/00			Various Newspaper Articles from 1983-84	18
15	00/00/42	Quincy Mining Company		Assay of Waste Sands	44
16	00/00/70	MDNR		Ground Water & Geology of Keweenaw Peninsula, Michigan	47

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18	09-00-77	Wright, T., et.al., Professor		Article: water quality deterioration of Torch Lake by Copper Leach Liquor	14
19	09-00-77	Joralemon, L.		Excerpt From Book Entitled: Copper, The Encompassing Story of Man's First Metal	16
20	02-07-77	Michigan Water Resources Commission		An Evaluation of a Cupric Ammonium Carbonate Spill into Torch Lake	17
21	09-00-81	Kraft, K., et.al., Professor		Article: Effect of Sediment Copper on the Distribution of Benthic Macroinvertebrates in the Keweenaw Waterway	27
22	04-00-81	L.M. Miller & Associates	Houghton County	Hydrogeological Evaluation for Houghton County Wastewater Disposal	139
23	11-00-81	Quincy Mine Hoist Association		Excerpt From Book Re: Quincy Mining Company	19
24	10-14-82			USEPA Preliminary Assessment: Site Information	4
25	11-20-83	Smith, G., MDPH	Davis, Honorable R.	Response to Inquiry	1
26	00-00-84	Malueg, K. et.al., USEPA		Environmental Toxicology and Chemistry Article on Toxicity of Sediments (includes Torch Lake)	13
27	01-04-84	Sause, A., USEPA	Evans, "Red"	Phone Conversation	4
28	01-23-84	Sause, A., USEPA	USEPA	Preliminary Assessment Comments	1
29	01-25-84	Sause, A., USEPA	Courchaine, C., MDPH	Phone Conversation Report on Well Water	2
30	01-25-84	Courchaine, C., MDPH	Sause, A., USEPA	Safety of Well Information	5
31	01-27-84	Sause, A., USEPA		USEPA Site Inspection Report	14
32	01-30-84	Sause, A., USEPA		MRS Work Sheets	25
33	02-21-84	Levin, C., Senator	Aittama, J., Village Water Dept.	Pollution Study	2
34	03-01-84			Meeting Notes on Trout for Torch Lake (handwritten)	2
35	03-07-84	Aittama, J. Village Water Dept.	Juntunen, R., MDNR	Request to Stock Fish in Torch Lake	2

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16	11/15/84	Letten, R., MNR	Astoria, Ore. source water Dept.	Fish stocking	
17	12/15/84	Calabrese, J., USEPA	Deens, J., US Fish & Wildlife Service	Documentation for litigation for litigation	
18	12/15/84	Calabrese, J., USEPA	Deens, J., US Fish & Wildlife Service	Records of litigation for litigation	
19	12/15/84	Ross, M., Western Michigan University	Deens, J., US Fish & Wildlife Service	Cover to House Letter and Water Analysis	
20	12/15/84	Leddy, D., Michigan Technological Univ.	Deens, J., US Fish & Wildlife Service	Records of litigation for litigation	
21	12/15/84	Leddy, D., Michigan Technological Univ.	Deens, J., US Fish & Wildlife Service	Records of litigation for litigation	
22	12/15/84	Thomas, T., USEPA	Deens, J., US Fish & Wildlife Service	Records of litigation for litigation	
23	12/15/84	Leddy, D., Michigan Technological Univ.	Deens, J., US Fish & Wildlife Service	Records of litigation for litigation	
24	12/15/84	Leddy, D., Michigan Technological Univ.	Deens, J., US Fish & Wildlife Service	Records of litigation for litigation	
25	12/15/84	Leddy, D., Michigan Technological Univ.	Deens, J., US Fish & Wildlife Service	Records of litigation for litigation	
26	12/15/84	USEPA	Deens, J., US Fish & Wildlife Service	Records of litigation for litigation	
27	12/15/84	Deens, J., US Bureau of Mines	Deens, J., US Fish & Wildlife Service	Records of litigation for litigation	
28	05-14/85	Viegelahn, G., Peninsula Material Processing	Deens, J., US Fish & Wildlife Service	Records of litigation for litigation	
29	07-09/86		Deens, J., US Fish & Wildlife Service	Records of litigation for litigation	
30	08/00/86	Michigan Technological University	MDNR	Torch Lake Study: A Project Completion Report	306
31	08/00/86	Ross, M., et. al., Michigan Technological University	MDNR	Torch Lake Study: Heavy Metals in Sediments & Mining wastes	33

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51	1-15-87	Soence, J., Michigan Technological University	Martin, T., MDNR	Documentation of Fish Tumors and Parasites	11
54	07-28-87	Klemans, C., MDNR	Concerned Individual- s	Status Report	3
55	10-22-87	Irvin, T., MDNR		"Mistake" or Markings for Lake Linden and Hubbel (Handwritten)	1
56	10/27/87	MDNR		Remedial Action Plan	61
57	10/1/88			Topographical Map of the Portage Lake Mining District	2
58	09/00/88	Clements, W., et. al. Scientists		Environmental Toxicology and Chemistry Article on Insect Exposure to Copper	6
59	09/00/88	Michigan Water Resources Commission		Permit Authorizing Discharge & all Relevant Communications Including Public Notice, Previous Permit, Transmittals	62
60	03/00/88	National Park Service		Options for National Park Service Involvement in the Management of Historic Copper Mining Resources on Michigan's Keweenaw Peninsula	48
61	09-28/88	Soence, J.,		The Keweenaw Waterway: Status Report with Suggested RI FS Options for Developing a Comprehensive RI Plan	47
62	11/22/88	Center for the Great Lakes		Fact Sheet: Great Lakes Areas of Concern	3
63	12/00/88	Donohue & Associates		Composatory Summary	21
64	12/06/88	Grannemann, N., US Dept. of Interior	Anderson, J., Donohue	Letter and Groundwater Data	22
65	12/20/88	De Grand, B., MDNR	Lee, J., USEPA	Documents re: Private and Public Water Supply Wells	70
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67	01/30/89	Evans, E., MDNR	Aittama, J., Village Water Dept.	Review Comments on the Michigan Technological Univ.'s Final Report	15

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68	12/01/89	Michigan Fish Commission		Fish Collection Data From Torch Lake	31
69	1/22/89	Hesse, J., MDPH	Rome, J., MDPH	Cover Memo and Health Assessment of Contaminants Present in Soils in Isolated Areas of the Jefferson Connor Industrial Revitalization Project Site (2-18-89)	5
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71	03/02/89	Reith, S., USEPA	Croce, M., USEPA	Memorandum: Torch Lake CR Trip Information	10
72	04/10/89		MDNR	Municipal Discharge Application	29
73	04/24/89	Center for Environmental Health Sciences & MDPH	Office of Health Assessment, ATSDR	Preliminary Health Assessment (November 9, 1988)	5
74	05/00/89	Markelz, P., Donohue	USEPA	Site-Specific Health & Safety Plan: Torch Lake Geophysical Investigation	15
75	06/00/89	Donohue & Associates	USEPA	RI/FS: Field Sampling Plan, Vol. 2, Revision	142
76	06/00/89	Donohue & Associates	USEPA	RI/FS: Final Work Plan, Vol. 1A, Revision 1	149
77	06/00/89	Donohue & Associates	USEPA	RI/FS: Health & Safety Plan, Vol. 4, Revision	115
78	06/00/89	Donohue & Associates	USEPA	RI/FS: QAPP For Phase 1, Revision 1	180
79	06/05/89	Tech, R., MDNR	Gruben, D., MDNR	RI/FS Air Sampling Program	3
80	07/00/89			Revisions/Additions to Field Sampling Plan	37
81	07/14/89	Gruben, D., MDNR	Lee, J., USEPA	Cover, Field Notes and Well Sampling Map	4
82	07/25/89	Anderson, A. & Beodray, F., Weston-Sper	Lee, J., USEPA	Well/Sample Data Sheets: July 17-21, 1989	104
83	07/28/89	Rector, D., MDNR	Adams, V., USEPA	Michigan's Cooperative Agreement for Technical Assistance	5
84	08/00/89	USEPA		Superfund Fact Sheet	8
85	08/08/89	Healy, M., Weston	O'Mara, M., Weston	Analytical Reports	84
86	08/23/89	Healy, M., Weston	O'Mara, M., Weston	Cover and Analytical Reports	48
87	09/28/89	Richardson, D., Donohue	Markelz, P. & Ransome, L., Donohue	Health & Safety Program	2

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90	09/14/89	Stenson, R., Donohue	Ransome, L., Donohue	Bureau of Mines Site Visit	1
91	09/15/89	Stenson, R., Donohue	Ransome, L., Donohue	Shallow Surface Tailings Sampling	4
92	09/15/89	Stenson, R., Donohue	Ransome, L., Donohue	Technical Memorandum: Inventory of Existing wells	16
93	09/18/89	Maletzke, J., Donohue	Ransome, L., Donohue	Technical Memorandum: Operable Unit 03, Archive Search & Field Reconnaissance	26
94	09/18/89	Maletzke, J., Donohue	Ransome, L., Donohue	Technical Memorandum: Soil/Tailings Sample Shipment	3
95	09/25/89	Stenson, R., Donohue	Lee, J., USEPA	Cover Letter to Field Technical Memoranda for 8/89	1
96	09/29/89 08	Maletzke, J., Donohue	Ransome, L., Donohue	Technical Memorandum: Phase 1 Soil Sampling	3
97	10/02/89	Ray, D., Center for the Great Lakes	Lee, J., USEPA	Letter and Partial Fact Sheet on Areas of Concern dated 8/1/89	3
98	10/18/89	Ross, C., USEPA	USEPA	Mineral Sampling Results	8
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100	10/27/89	Kubiak, T., US Dept. of Interior	Lee, J., USEPA	Proposal: Reproduction in Gulls & Bald Eagles in the High Copper Environment of Torch Lake	10
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104	11/13/89	USEPA		News Release Re: Water from Mason and Lake Linden Municipal Wells	2
105	11/29/89	Ross, C., USEPA	USEPA	Metal Sampling Results	13
106	12/01/89	Stenson, R., USEPA	Ransome, L., USEPA	Technical Memorandum: OUIII, Archive Search & Field Reconnaissance	39

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109	12/05/89	Irvin, T.. MDNR	Gruben, D.. MDNR	Air Monitoring Locations	2
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